

MAY 1 1995

THE Great Water Connection



Alberta
ENVIRONMENTAL PROTECTION

The Great Water Connection

Have you ever been outside while it was raining? Did you wonder where all the water came from?

Have you ever splashed in a puddle left by the rain? Did you wonder what happens to the water when the puddle disappears?

In one way or another water affects everything. Your task will be to discover some ways water affects us and the things around us.

You will be looking for the **water connections**.



What Do You Know About Water?

See how much you know about water by trying to answer these questions before you work through this booklet.

1. What is there more of on the earth: fresh water or salt water?
2. How many litres of water would be wasted per day if a tap leaked just one drop of water per second?
3. In Alberta, which uses more water: agriculture or households?
4. What percent of household water is used by flushing toilets?
5. During the summer months our daily water use increases by 50%. What causes this increase in water use?
6. Of all of the uses of water in our homes, what percent of water is used for drinking and cooking?
7. Which part of the province uses more water, the northern part or the southern part ?

* answers to these questions can be found on the back of this page

Water Answers

1. Only 3% of the world's water is fresh water. The remaining 97% is salt water.
2. 25 litres per day
3. Agriculture
4. 43%. We use the most water in the bathroom.
5. Outdoor uses such as lawn and garden watering and car washing.
6. 5%
7. 80% of the water is used in the southern part of the province. However, 80% of the water flow is in the northern part of the province.

Part One

Water and Me: What is the Connection?

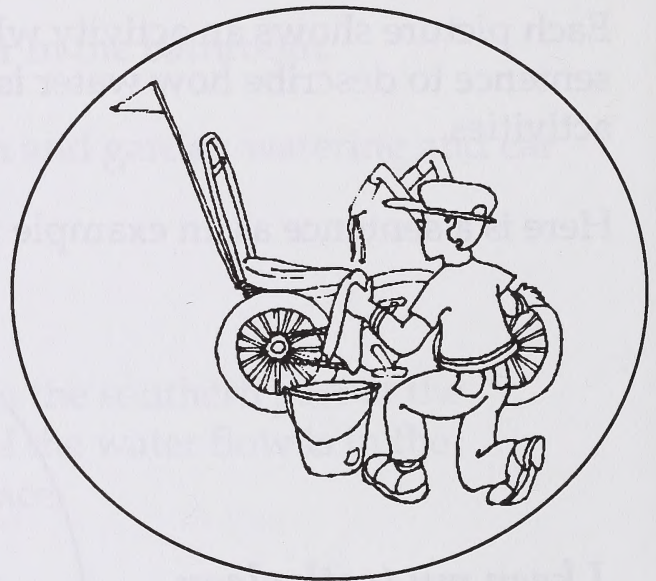
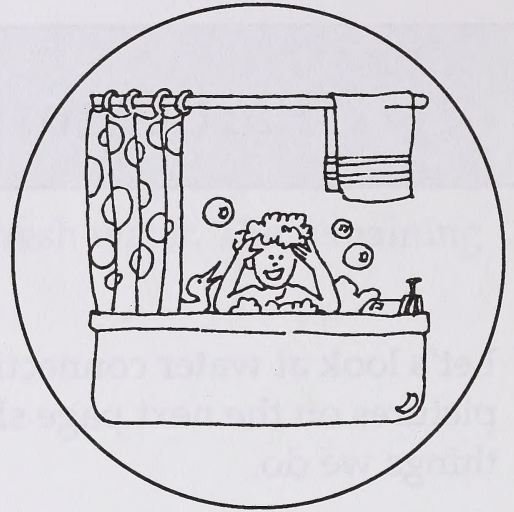
Let's look at water connections by starting with ourselves. The pictures on the next page show how water is connected to the things we do.

Each picture shows an activity where people use water. Write a sentence to describe how water is used in each of these activities.

Here is a sentence as an example for the activity shown.

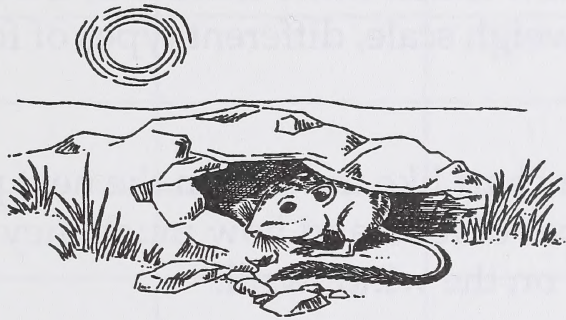
*I keep my teeth clean
and white by using
water to brush my teeth.*





Living Things Are Made Of Water

One very important water connection is that all living things need water to live. Every day we have to replace the water in our bodies that we use up. We do this by drinking or by eating food that has water in it.

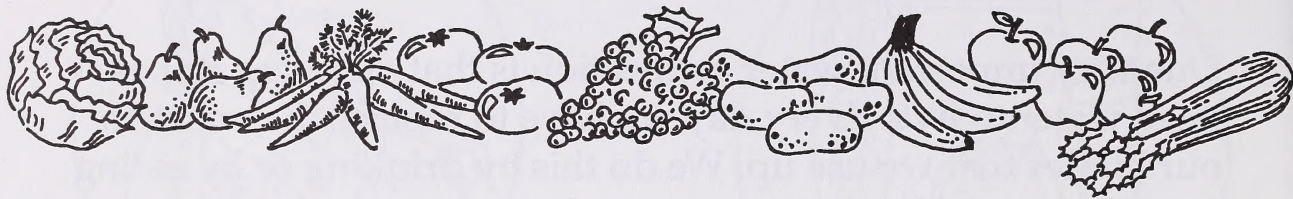


Did you know that water makes up over half of our body weight? Without water to drink, we can only live for about four days. Some animals, like the kangaroo rat that lives in the desert, can live much longer without water. This is because it uses water very carefully. Kangaroo rats don't move around much in the daytime. They also don't sweat very much!

Humans lose up to 4 litres of water every day. This is the same as about 20 cups of water. The food that we eat helps to replace some of the water that our bodies lose.



Water We Eat!



You can find out how much water there is in the food you eat. All you need is a weigh scale, different types of food and a sunny window!

Start by drawing a chart like the one on the next page. On your chart write the types of food and how much they weigh before and after they dry on the windowsill.

Here's how to do it:

1. Gather different types of fruits and vegetables. You might want to try pieces of apple, carrot, banana, lettuce or celery.
2. Cut the fruits and vegetables into pieces that are close to the same size.
3. Using a kitchen scale, weigh each piece and write down the weight on the chart that you have made.
4. Place the pieces of food to dry on a sunny windowsill.
5. After the food has dried, weigh it again. The weight loss is equal to the amount of water that was in the food.



Observation Chart: Water Content of our Food

Type of Food	Weight before Drying (A)	Weight after Drying (B)	Difference (A-B)

Questions:

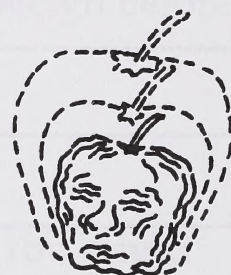
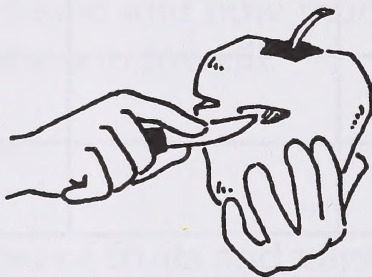
1. Which food sample contained the most water?
2. Which food sample contained the least amount of water?
3. Can you think of a better way of drying food?
4. What does the word "dehydrated" mean? Can you think of foods that have been completely or partly dehydrated?



Head Shrinkers

The skin on an apple keeps the fruit inside from drying up. Find out just how important an apple's skin is by comparing one that is peeled to an apple that still has its skin left on.

Peel your apple and use a knife to carefully carve a face into it. The drawing on this page will show you how to do this. Cut out slices for the nose, chin and cheekbones. Use the knife to make openings for the eyes and mouth.



Weigh the carved apple and another that is un-peeled. Record the weight of each on a table like the one shown on the next page.

After you have finished weighing your apples, place them in a dry area for three to four weeks. Be sure to weigh your apples at least once every week. Any changes in weight or appearance should be recorded in your observation chart.



Observation Chart: How Important is an Apple Skin?

Date	Weight (Peeled)	Weight (Unpeeled)	Observations
Week 1			
Week 2			
Week 3			
Week 4			

Questions:

1. What happens to the peeled and un-peeled apples as time goes on?
2. What could this experiment tell us about the importance of our own skin?
3. Which apple lost the most weight? Why?



Water Facts

Solve each math problem. By placing the correct answer in the box, you will discover an amazing water fact!

1. $(97 - 34) + 12 = \underline{\hspace{2cm}}$ It takes litres of water to grow one ear of corn.

2. $(24 + 56) \times 4 = \underline{\hspace{2cm}}$ About percent of the world's surface is covered with water.

3. $(26 - 11) \div 5 = \underline{\hspace{2cm}}$ You will save about litres of water by wetting your toothbrush and filling a glass for rinsing each time you brush your teeth.

4. $2 \times (32 - 27) = \underline{\hspace{2cm}}$ It takes about cm of snow to equal one cm of rain.

5. $(75 \div 3) \times 4 = \underline{\hspace{2cm}}$ Your dishwasher uses about litres of water for each load.

6. $17 + 43 + 23 = \underline{\hspace{2cm}}$ Blood is about percent water.



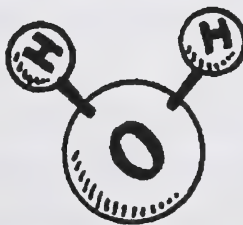
Part Two

What is Water?

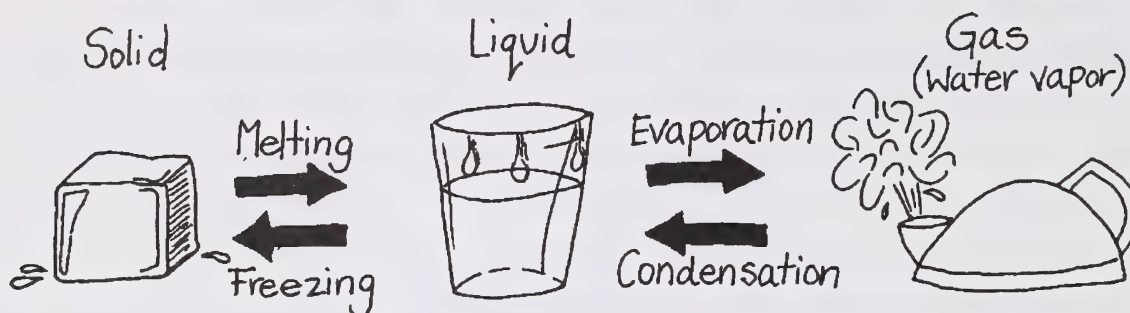
If we stopped to imagine what it would be like in a world without water, we would certainly appreciate how important water really is. How would you describe water to someone who didn't know anything about it? What makes water so special?

Let's take a look at what water really is!

All things are made up of very tiny particles called atoms. Atoms join together to make up molecules. Hydrogen and oxygen are two types of atoms. A water molecule is made up of two atoms of hydrogen and one atom of oxygen. The chemical symbol for hydrogen is H and the symbol for oxygen is O. This is why water is sometimes called by its chemical name " H_2O ". There are over one billion water molecules in a single glass of water!



Water is the only substance on Earth that can be found in three different forms. Scientists refer to these forms as “states”. The three states of water are called liquid, solid and gas. Liquid water is what you use to wash with, water your plants and to drink. Examples of solid water are skating ice and ice cubes. An example of water becoming a gas is the steam rising out of a kettle of boiling water.



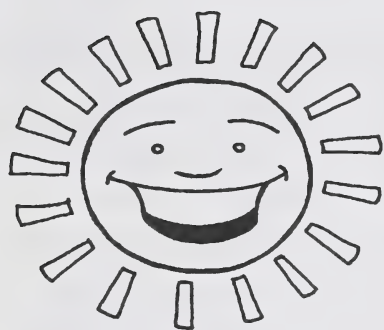
Have you ever wondered how water gets from one state to another? Sometimes we change the state of water for a reason. Can you think of a reason for freezing water to make ice cubes. Other changes in water happen all the time without our help. Here are four examples of how water can change states.

1. Evaporation

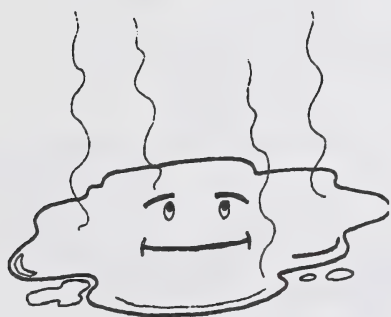
Water can change from a liquid to a gas. This process is called evaporation. Sometimes it's easy to see water evaporate.

When water boils, you can see steam or water vapour rising off the bubbling surface of the water. Eventually all the boiling liquid water will change into water vapour.





The speed at which water evaporates depends on the temperature of the water and the air. When it is warm, water easily changes into a gas (Remember the boiling water which is **very hot**). Now think about the water puddles on the road after it rains. That water in the puddles will also change into water vapour but not because the puddle is boiling!



Evaporation happens at temperatures much cooler than boiling water. It just takes a little more time. The puddle will slowly begin to get smaller and smaller as more of the liquid turns into vapour and goes into the air. The puddle will disappear faster if the sun is shining brightly. Can you explain why?

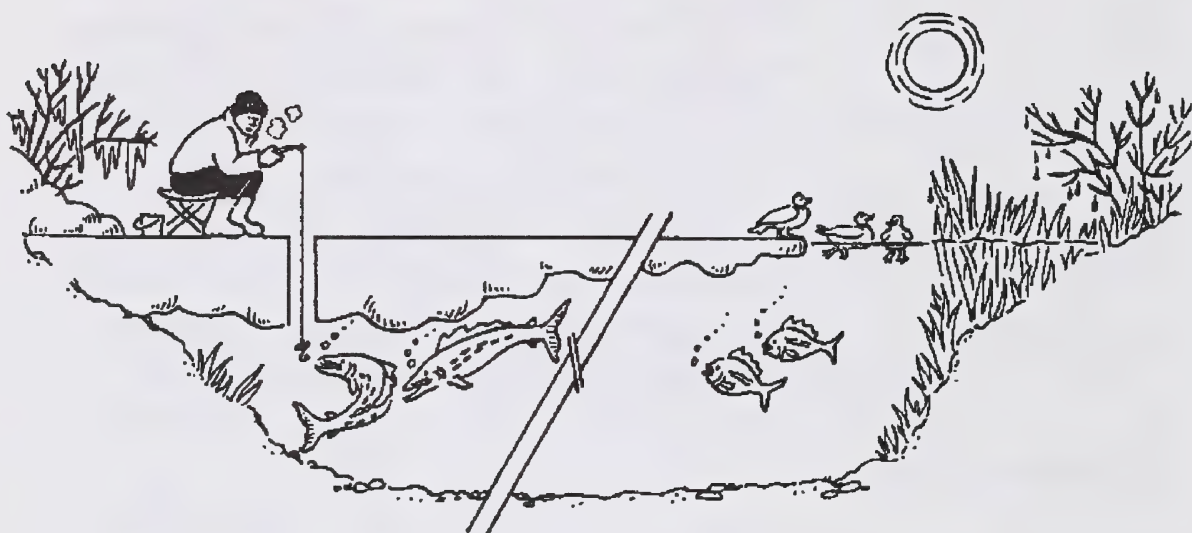
2. Condensation

Water can change from a gas to a liquid when it cools. That is why a jug filled with very cold water gets a foggy moisture layer on the outside. The water vapour in the air around the jug cools and turns into water drops that you see on the outside of the jug.



3. Freezing

Water can change from a liquid to a solid. This happens at cold temperatures around 0°C . Have you ever wondered what happens to animals and plants that live in lakes during the winter? The water at the top of the lake freezes solid. Many living things are protected during the winter under this frozen layer of ice. Water is the only liquid that starts freezing from the top down. Can you think why this is important to animals living in the water?



4. Melting

Water can change from a solid to a liquid. In the spring when the temperature warms up, we see lots of melting as the solid ice turns into a liquid. Snowmen melt and icicles drip.

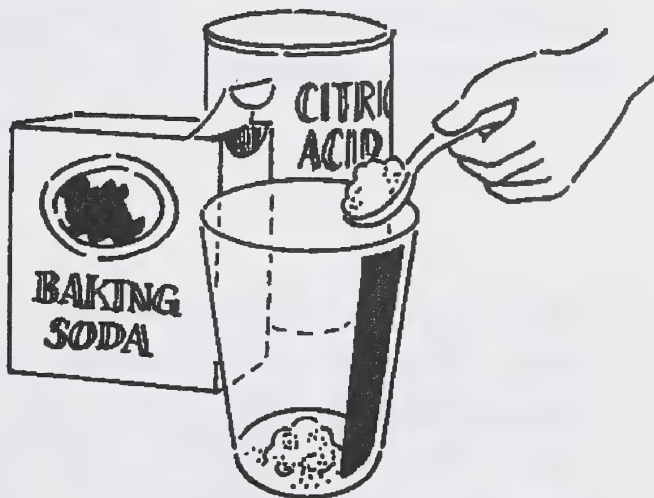


What Happens If...?

Water is different than any other substance on Earth because it has some special characteristics. Find out what amazing things water can do by trying some of these activities.

1. Water can dissolve many things.

Many chemical reactions will occur only if the chemicals are first dissolved in water. In a dry glass add one spoonful of baking soda and one spoonful of citric acid. Mix the two chemicals together. Is anything happening? Now add two spoonfuls of water and see what happens!

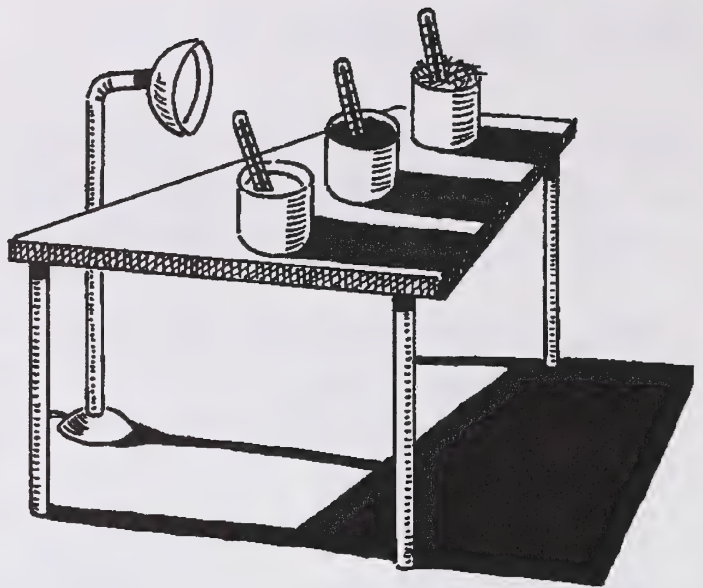


2. Water molecules cling together.

Completely fill a glass (right to the top) with water. Now, slowly add pennies one at a time into the glass. How many pennies can you put in before the water overflows? Without moving the glass, carefully look at the surface of the water from the side. What is the shape of the water surface?



3. Water takes a long time to heat up and cool down. Compare water with some other things. Aim a heat lamp at water and some other substances. Which heats up the fastest?



4. Water molecules cling to each other. As water slowly moves upward inside a plant, it draws other water molecules along. Important nutrients are also carried upward with the water. Put a freshly cut flower into a glass of water with 10 drops of dark food coloring. What happens to the flower and its stem after half an hour? After one hour? After one day?



Part Three

What are Water Words?

Water words are words that have something to do with water. The next two pictures are from the poster called **The Great Water Connection**. This poster shows some ways that living things are connected to water. Using these pictures, how many water words can you think of?



Water is important to people. We need water to live. We depend on plants and animals that need water. We also use water for fun, work and energy. Can you think of ways that other living things use water?



Let's see what else you know about water.

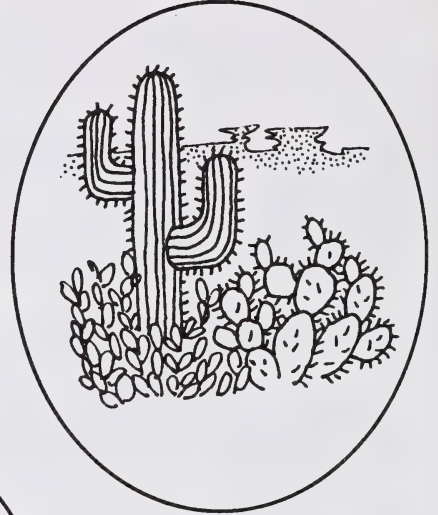
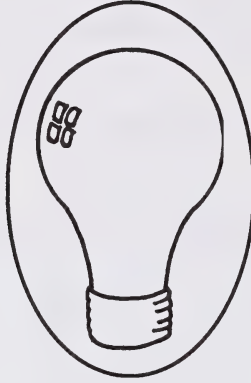
Read each of the following sentences carefully. Decide whether each sentence is true or false. Don't be fooled!

1. We are conserving water when we do not waste it.
2. Water takes the shape of the container that it is in.
3. Water will change to solid ice at 0°C .
4. Water first starts to boil at 110°C .
5. Water vapour forms clouds in the earth's atmosphere.
6. Things can disappear from view when they dissolve in water.
7. Water normally runs uphill.
8. Every living thing needs water to live.
9. Rain and snow are called precipitation.
10. When water changes from a liquid to a gas, it is said to evaporate.
11. When we don't have enough water, we have a drought.
12. Water evaporates quickly when the weather is hot and dry.



A Picture Quiz to Test What You Know

Look at each picture below. What does each one have to do with water? Can you solve these mysteries?



Part Four

Is Water a Natural Resource?

What is a Natural Resource?

A resource is something that supplies people with things they need. Some resources are part of our natural surroundings. They are called **natural resources**. Some examples are oil, gas and forests.

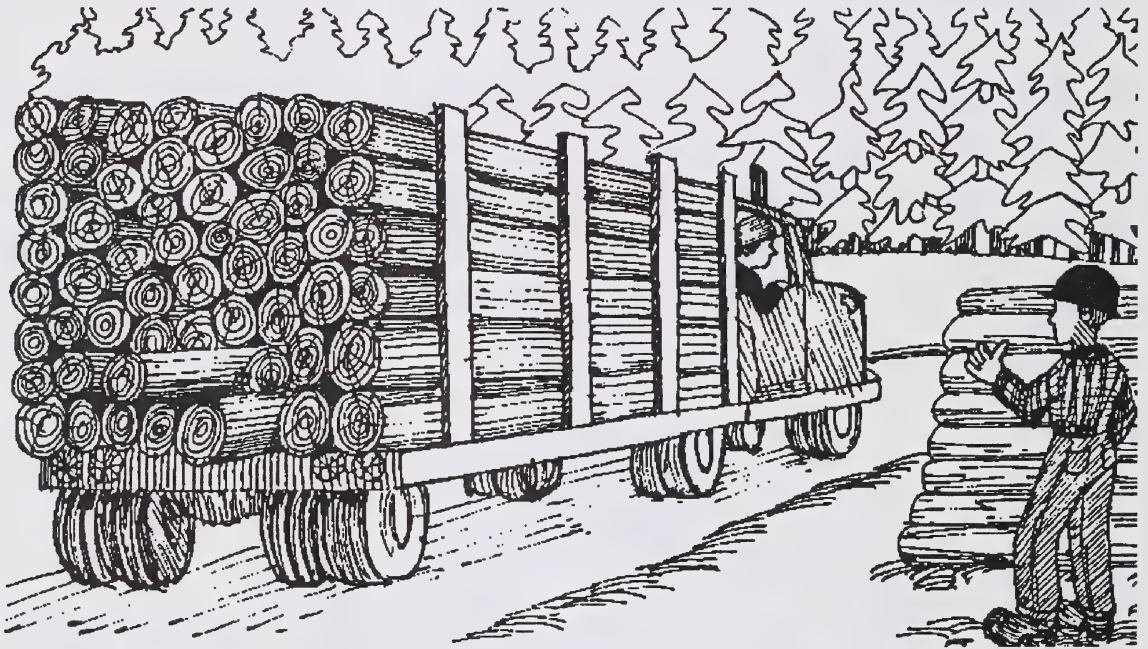
From natural resources people produce things that they need. We use the resources found in our province for many things. Here are three examples of natural resources found in Alberta. Water is also a natural resource. Let's find out how water is like other natural resources. Then we will see how it is different.



Alberta's Natural Resources

The Forest Natural Resource

In Alberta, there are many forests. The forests are a natural resource. Trees supply us with many things. Lumber from the trees has many uses. Trees also supply wood for fuel. Some forests provide great places to visit, hike and camp. These are examples of how a natural resource, like a forest, supplies us with things we need.



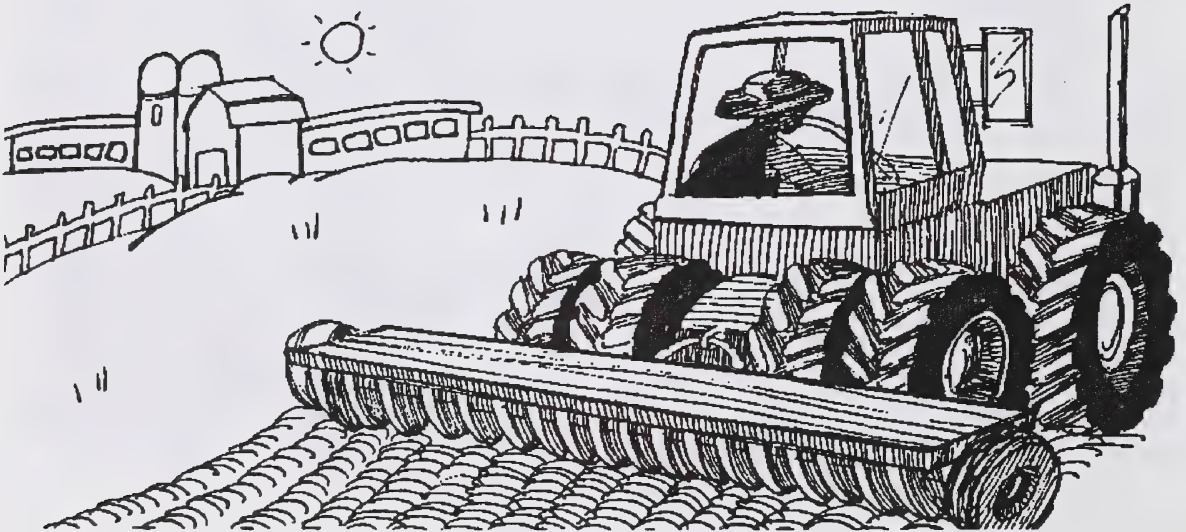
The Oil Natural Resource

In Alberta, oil is found deep in the ground. It is a natural resource. Gasoline is just one product that comes from oil. Without gasoline, travel in Alberta would be difficult. We like to travel. Gasoline, from the natural resource oil, makes travel possible. Plastic is also made from oil. Many products that we use each day are made from plastic. Can you name five different plastic products?



The Soil Natural Resource

The soil is also a natural resource. It supplies something we need. It helps in the growing of food. In Alberta, many farmers grow wheat, barley and oats. Without good soil, it would be hard to grow these plants. It might not be possible at all. Crops get harvested. They become food that we eat. Crops also feed animals like cattle or chickens. Even cattle and chickens eventually become food for people. Food is something we really do need.

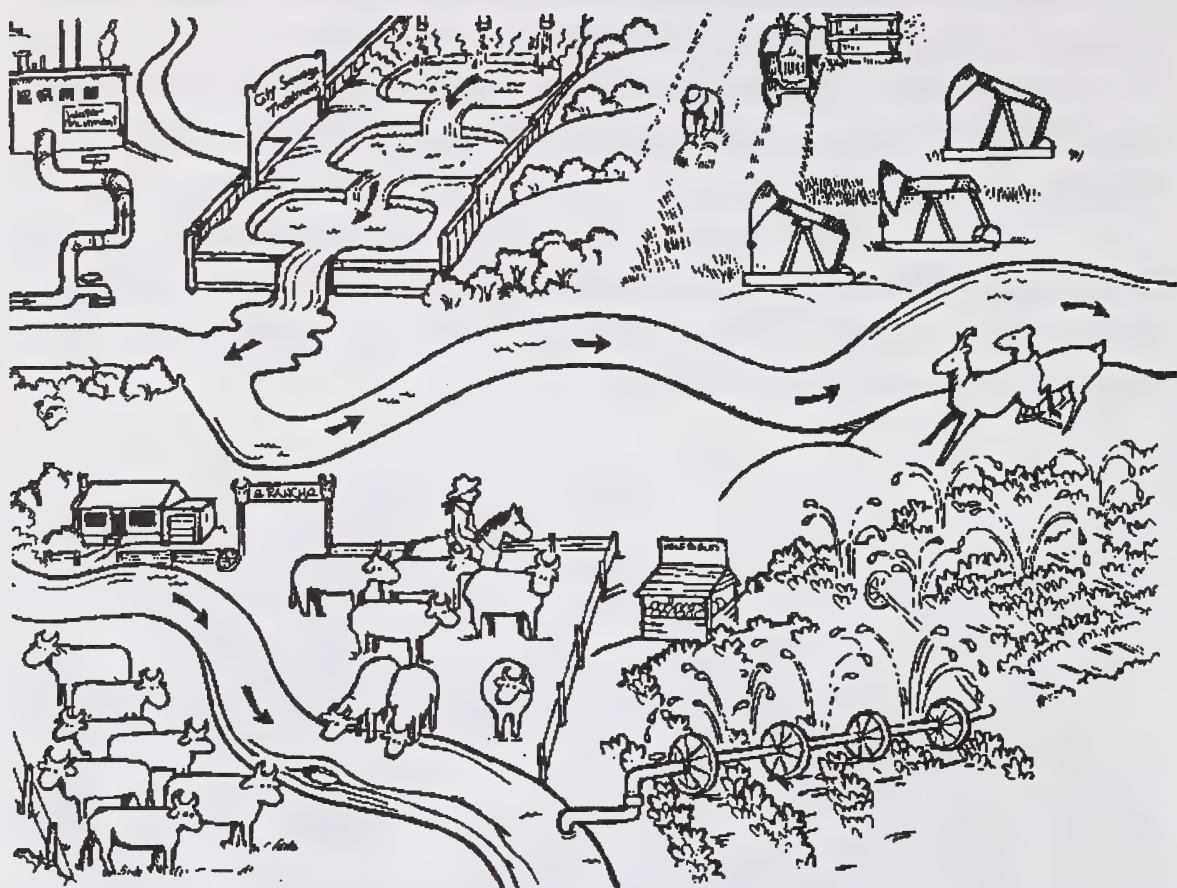


The Water Natural Resource

In Alberta, we have many lakes and rivers, sloughs and wetlands. Water is part of our natural environment. People use water in many ways. It supplies us with things we need. Water, then, is a natural resource just like the soil or the forests.

Look at the following two pictures. Can you list some of the ways water is used? This will help show that water is an important resource in Alberta.





Part Five

Is Water Renewable?

The word renewable may be a new word for you. It is a word that describes something we use that can be made new again. Many things in nature are renewable.

Another part of "The Great Water Connection" poster is shown on the next page. It shows some things that can be renewed and some things that cannot. Things that get all used up cannot be renewed. They are called non-renewable.

Which of these things in the picture are **renewable**? Which are **non-renewable**?

The food the ducks eat.

The clouds in the sky.

The fuel used by the airplane.

The oil pumped out of the ground.

The water in the lake.

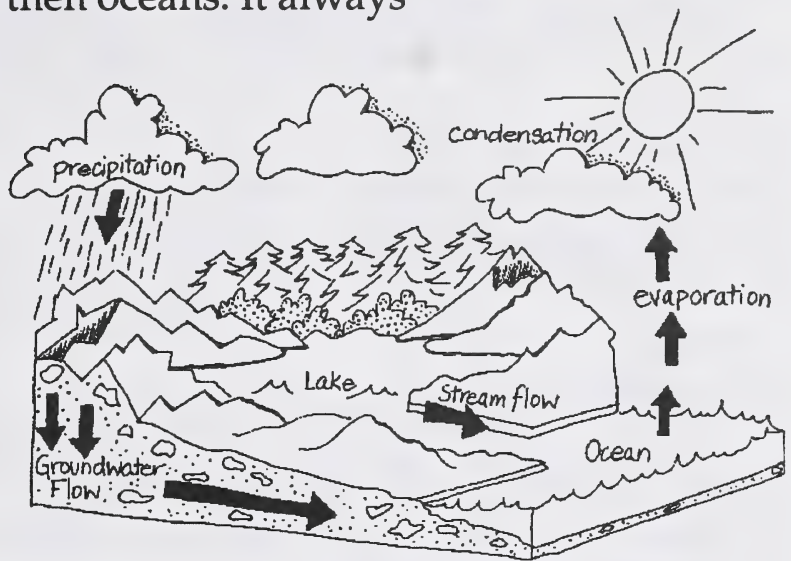
Perhaps you can find other things in the picture that you would call either renewable or non-renewable.

Why do you think the word evaporation is in the poster?
Explain why evaporation is important to our discussion





All over the earth, water falls as rain or snow. It flows from rivers into lakes and then oceans. It always returns to the air through evaporation. It falls again as precipitation. This is called the water cycle.



Water is renewable. It can be used by a fish, a tree or a person and later be reused. When it is used, it is not used up. We may change it for a short while. But, it always returns to nature through the water cycle. It will eventually fall again as clean rain or snow somewhere else. Water is renewable because it gets recycled. It also can clean itself after it has been used. When it evaporates into the air, it leaves behind the things that have been added to it.

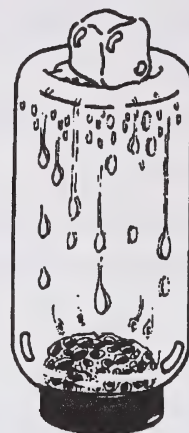
Sometimes things are added to water so it is no longer clean. It is not safe to use. It is polluted. If water were not renewable, our rivers and lakes would be worse off. They would not get the chance to clean themselves. What types of things do we add to water in the environment? Why should we still be careful about what we put in even though the water gets recycled?



Here is a simple experiment. It shows how water gets recycled. Let's see how water renews itself. This experiment will show you how the water cycle works.

Each group will need:

- 1 wide-mouth jar with lid (500 mL size)
- 1 small piece of sponge cut to fit the lid
- 1 ice cube
- 1 spoon
- some hot water



To see the water cycle, do the following.

1. Place the sponge in hot tap water until it is fully soaked.
2. Put the sponge on the lid.
3. Set the lid on a flat surface where it can't fall.
4. Turn the jar upside down. Screw it onto the lid.
5. Put an ice cube on top of the jar. Pour a teaspoon of water over the ice cube. Watch what happens.

Observation Chart: What happens in the jar?

Immediately	After 2 Minutes	After 5 Minutes	Overnight



Part Six

Water Affects Animals

Besides being an important resource for people in Alberta, water is also important to Alberta's wildlife.

All animals need water to stay alive and healthy. Certain animals must have water for other reasons. Here are two examples.

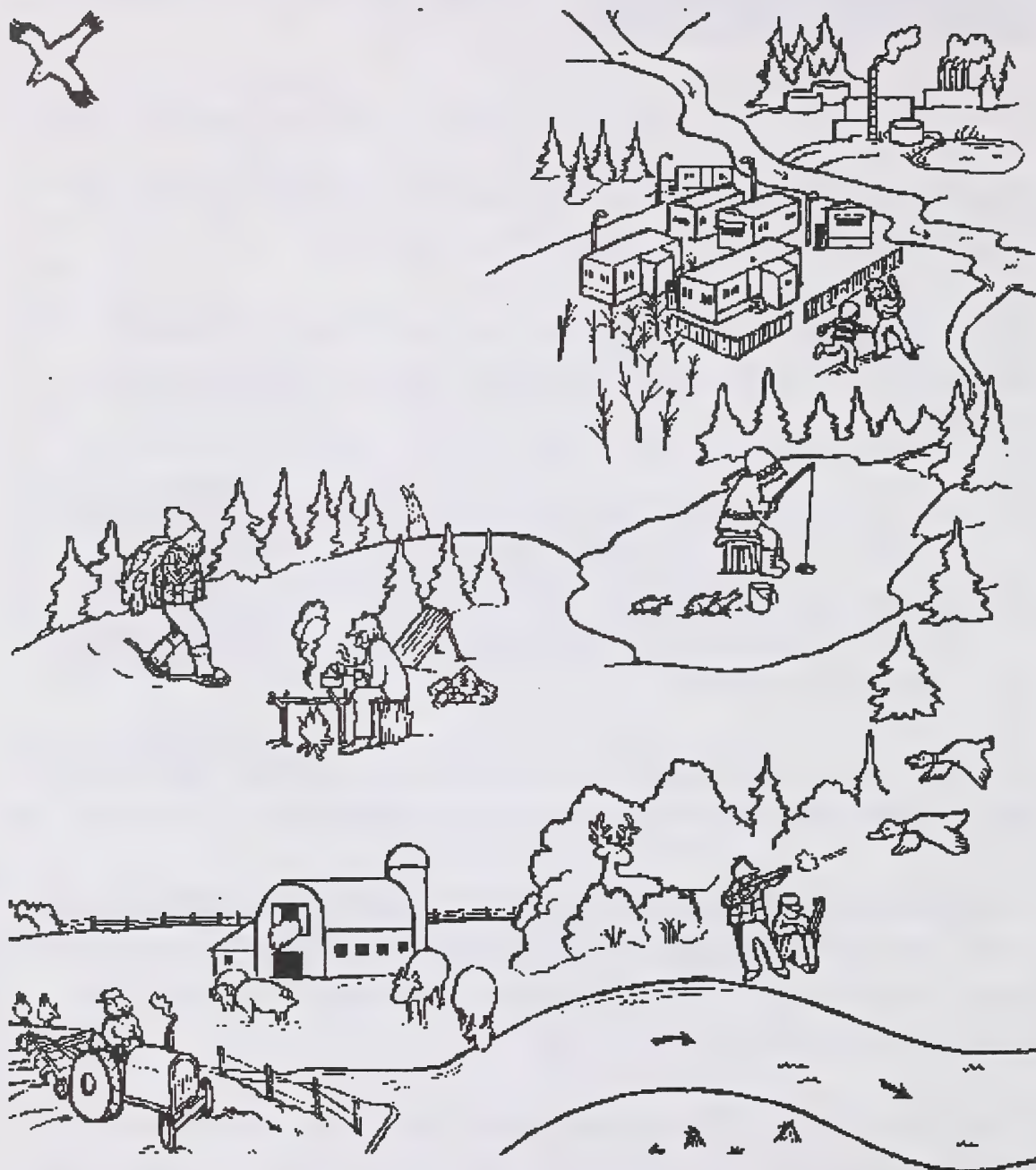
1. A frog needs to find water to lay its eggs. The tadpoles live in the water before they become adults.
2. A mosquito needs to find water to lay its eggs. The young mosquito larvae live in the water before they become adults.

For these creatures water has special importance. The water is their home. They live there for part of their life.

The piece of the poster puzzle on the next page will help you to do the following task. Add the names of a few animals to the water words list in part three. Note the special connections some animals have with water.

Don't stop there. If you have time, check the rest of the poster. Can you find any other animals that have special connections with water?



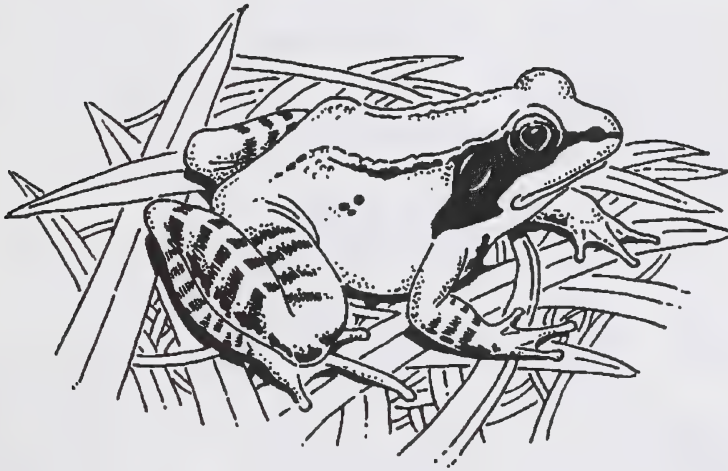


Adaptations

Living in the water is much different than living on land. Many animals have special features called adaptations that help them live in the water.

Think of what it would be like if you lived in water all the time. Would it be cold in the winter? Would your skin get all wrinkly? Would you get tired trying to stay afloat all the time? People like to go in the water but not all the time. We do not have the adaptations needed to live in the water but other living animals do.

Look at the frog. This frog is a good example of something that has adaptations which help it live in the water.



Look at this frog's back legs. Notice that the back legs are large and strong to help it to swim and hop.



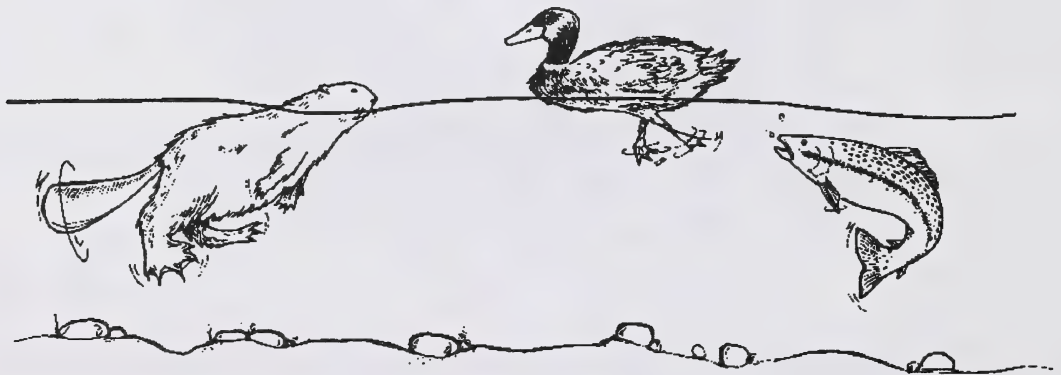
Look at the frog's toes. They have webbing between them to help them push through the water when they are swimming.

Look at the frog's eyes. It might be hard for us to see under the water but frogs actually have a third eyelid. This helps them to see under the water. It's like wearing goggles all the time!

Look at the frog's skin. It might be hard for you to see, but its skin is very thin. The skin needs to be moist all the time because the frog can breathe and absorb water through its skin. This type of skin works well because frogs spend most of their time in the water! The colour of a frog's skin can also help him hide from predators that are hunting for their dinner.

These animals are adapted to living in a water environment.

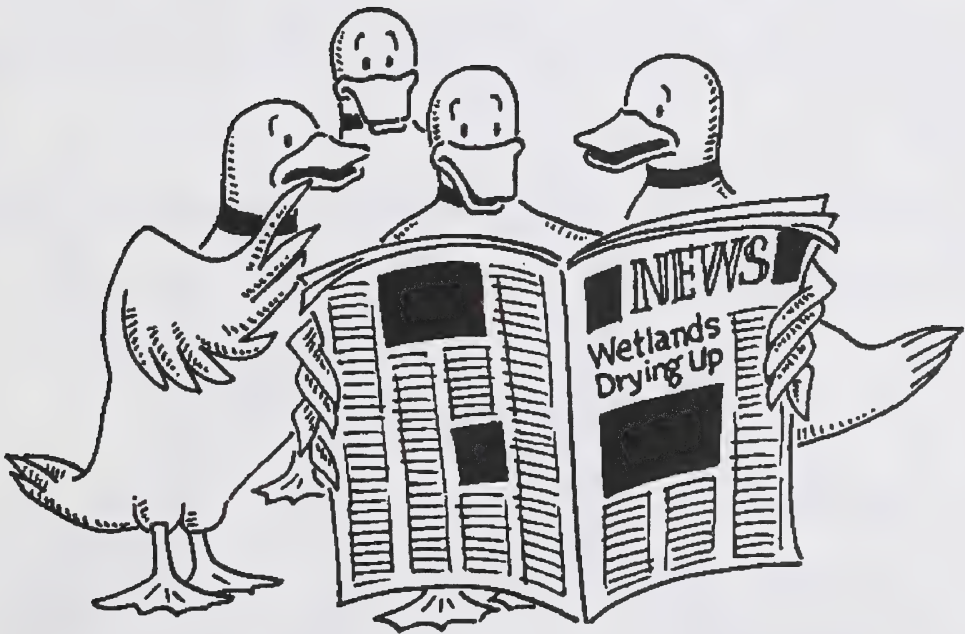
Can you list some of the ways that each animal has adapted? Do you see any adaptations that these animals have in common? Do you see any differences?



Water in Nature

Animals need water to survive. Lakes, rivers and marshes provide places for some animals to live. For others, water is a place to find food.

Water can also be a problem for animals. In times of flood, animals can drown. Avalanches, resulting from heavy snowfall, can take the lives of many mountain animals caught in their paths. Extreme lack of water causes a drought. If sloughs and wetlands dry up, ducks and other water birds may not find food and refuge.

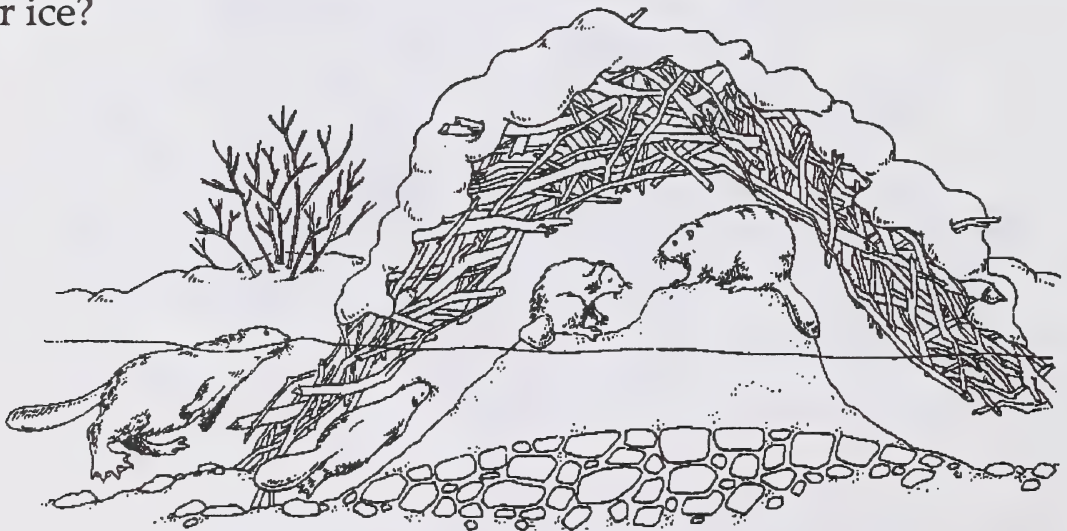


Water in Winter

As the seasons change, water affects the natural setting in different ways. In winter, streams and lakes are frozen over. Since the water is frozen, some animals must eat snow to get the moisture they need. Beavers keep food in the water under the ice that covers the ponds. Snow can hide a bear's sleeping den. The snow helps to keep the bitter cold winter air out. Snow covers plants on the ground. It protects them from the dry, cold air. Voles are animals like mice. They dig tunnels beneath the snow and find safety there.

Snow can be a hardship for some animals. Deer and buffalo have to dig through snow in winter to get their food. Ranchers must supply their cattle with hay when the snow covers the fields. Tracks left in the snow can be used to help locate the animals.

Can you think of other ways animals may be affected by snow or ice?



Part Seven

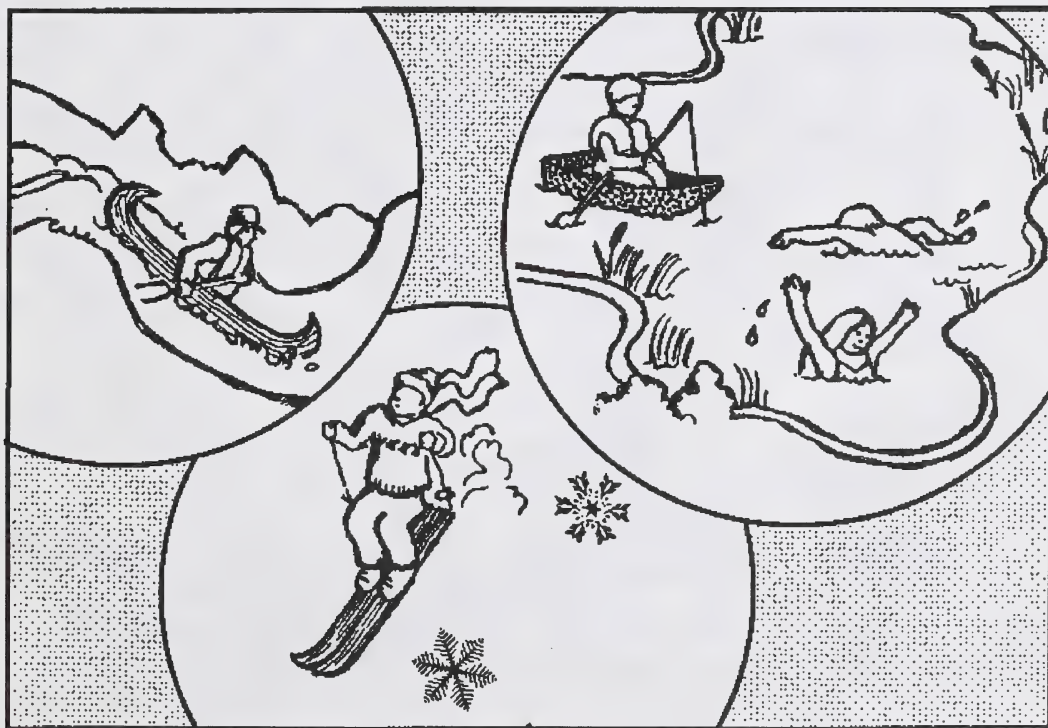
The Importance of Water to People

Why is water important to people? There are many reasons. Can you think of any? Take the clues from the poster puzzle to come up with some reasons. A heading has been included for each picture clue page.

Recreational Uses

Ways we use water for fun.

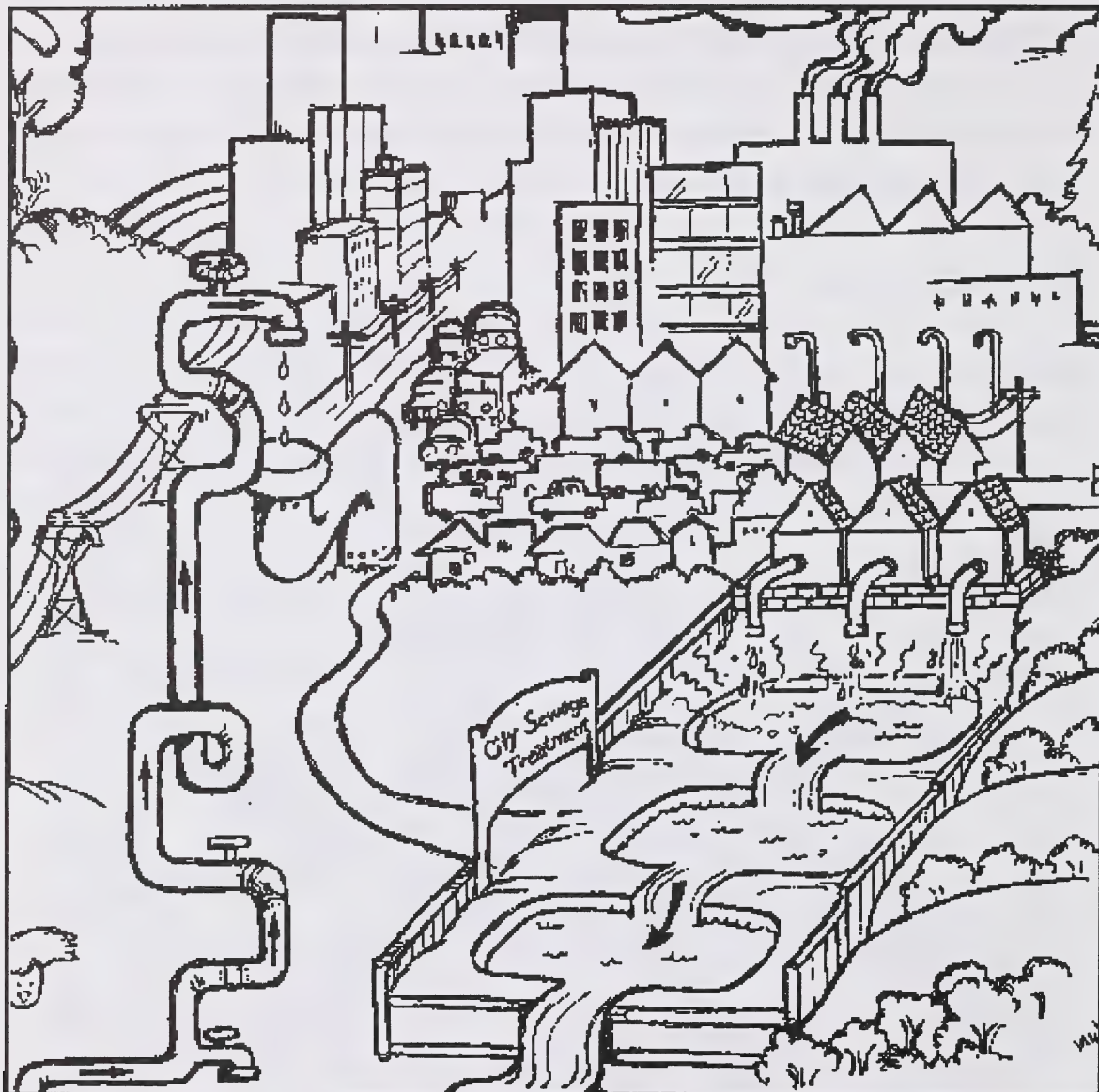
word clues: paddle, fish, rudder, swim suit



Municipal Uses

Ways we use water in cities and what is done to the water.

word clues: homes, cars, lawns, waste, fire



Agricultural Uses

The importance of water to farmers and ranchers.

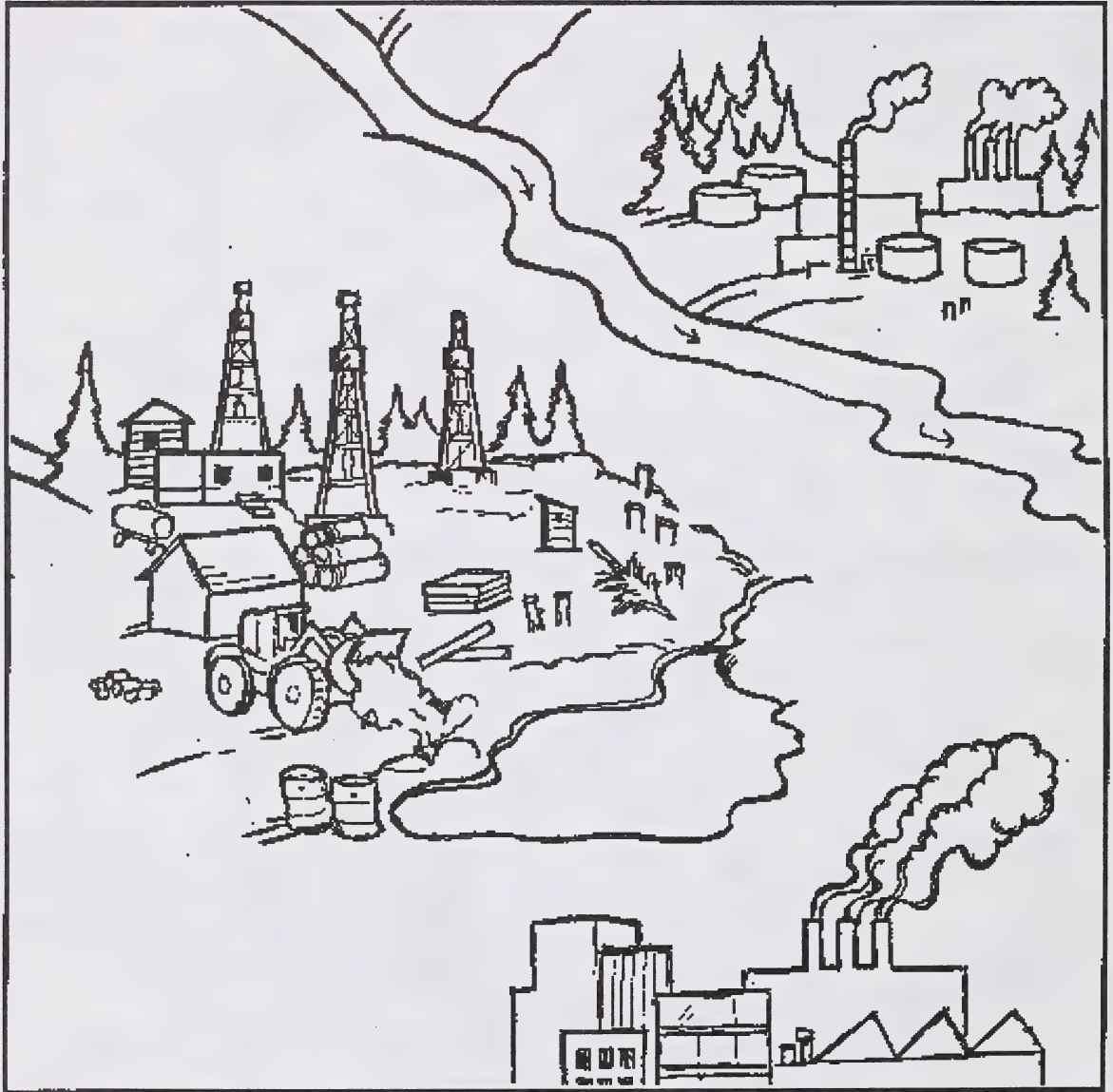
word clues: cattle, irrigation



Industrial Uses

The importance of water in forestry, mining and manufacturing.

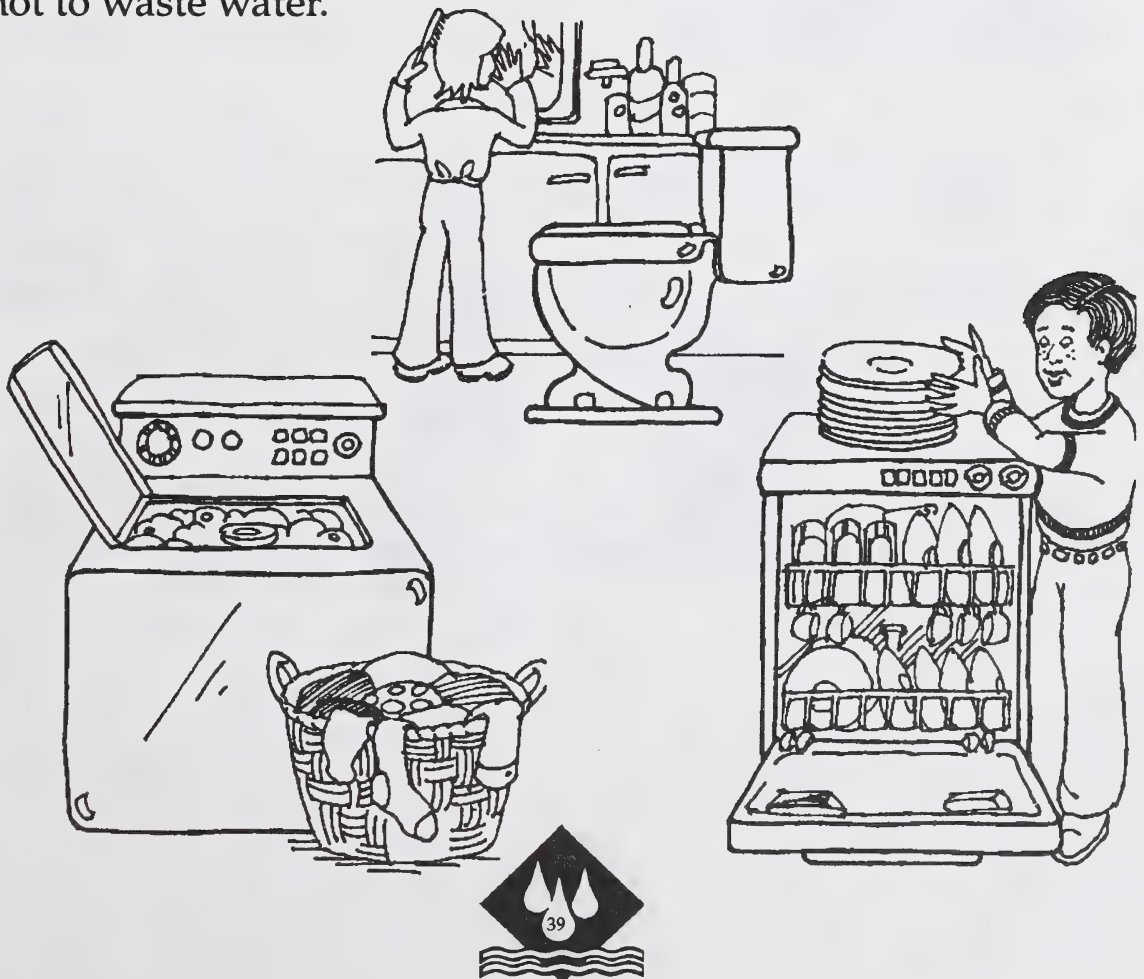
word clues: chemicals, waste



Part Eight

Taking Care of the Water Resource

We have learned how important water is to plants, animals and people. It is a natural resource that we can all share. When we share something like water, what we do can affect all other living things that need and use water. So, all of us have to be careful how we use water. The pictures on the next two pages show water uses. Think of a rule for people to follow in order not to waste water.





Be Water Wise! Use Water Sparingly.

Each Alberta family uses hundreds of litres of water a day. Sometimes we use more than we really need. Nature can only give us a certain amount of fresh water. If we waste it, there may be times when there won't be enough. In most of Alberta, we are lucky to have enough water for most of our needs. But it is still a valuable resource that must be protected. Like anything that you value, you should not waste water. Part of wise water use is trying to save or conserve water so that we always have enough.

Be Water Wise! Help Keep Our Water Clean.

It is important to conserve water by not wasting it. The other part of wise water use is to help keep the water fresh and clean.

- Do you remember all the places in the water puzzle where people add things to the water?



People living in cities and towns or working on farms and ranches, or in businesses and factories... all add things to the water in Alberta. People also add things to the water when they use it for fun.

- **Can you think of ways that we can help keep our water clean?**

List your ideas and concerns about using water. Perhaps by sharing your ideas with the rest of the class you can come up with a list of five or more. Then try them!



Alberta
ENVIRONMENTAL PROTECTION



Send your ideas as a class to:

Alberta Environmental Protection
Education Branch
9th Floor, South Tower
Petroleum Plaza
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